

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
12 August 2004 (12.08.2004)

PCT

(10) International Publication Number  
**WO 2004/068048 A1**

(51) International Patent Classification<sup>7</sup>: **F25D 017/08**

(74) Agent: BUCHANAN, Elspeth, Victoria; 61 Cambridge Terrace, P.O. Box 1250, Christchurch (NZ).

(21) International Application Number:  
PCT/NZ2004/000019

(22) International Filing Date: 2 February 2004 (02.02.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
523967 31 January 2003 (31.01.2003) NZ

(71) Applicant (for all designated States except US): Skope Industries Limited [NZ/NZ]; P.O. Box 1091, Christchurch (NZ).

(72) Inventor; and

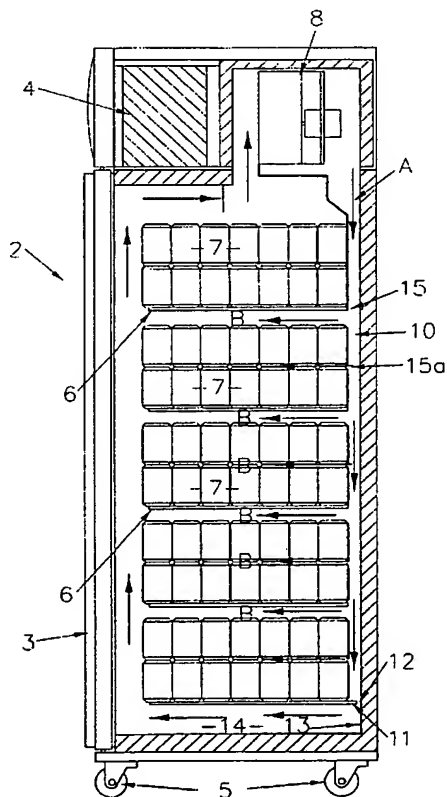
(75) Inventor/Applicant (for US only): SALT, Richard, George, Phillip [NZ/NZ]; 794 Hawkins Road, Marshlands, Christchurch (NZ).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK,

[Continued on next page]

(54) Title: IMPROVED REFRIGERATED CABINET



(57) Abstract: A refrigerated cabinet includes a fan assisted refrigeration unit and a duct in communication with the fan, for distributing cold air from the fan throughout the cabinet; the duct is substantially the full width and the full length of the product storage of the cabinet and at least a major portion of the duct has a substantially constant width; one end of the duct is in communication with a fan and the opposite end of the duct provides an end outlet; intermediate outlets are formed through the duct between the ends, to supply air from the duct to the product storage portion of the cabinet; the size of the end outlet is substantially smaller than the size of the intermediate outlets, so that in use the duct is pressurized compared to the remainder of the cabinet.

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TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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**Published:**

— *with international search report*

Title: Improved Refrigerated Cabinet

Technical Field

- 5 The present invention relates to an improvement in a refrigerated cabinet of the type in which cold air is circulated around the cabinet by a fan.

Background Art

- 10 For efficient refrigerated storage of product within the cabinet, it is important that cold air from the refrigeration unit is circulated evenly throughout the cabinet. In known designs, the evaporator of the refrigeration unit is fitted with one or more fans, which are driven to circulate cold air from the vicinity of the refrigeration unit throughout the body of the cabinet. However, air naturally tends towards the path of least resistance,  
15 and if the shelves of the cabinet are heavily stacked with product, restricting the spaces between adjacent shelves, air tends to move preferentially towards the opposite end of the cabinet from the fan, rather than between the shelves.

Disclosure of Invention

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It is therefore an object of the present invention to provide a refrigerated cabinet in which the above described problem is overcome or at least ameliorated.

- 25 A refrigerated cabinet which includes a fan assisted refrigeration unit and a duct in communication with said fan, said duct being adapted to distribute cold air from said fan throughout said cabinet;

- wherein said duct extends substantially the full width and the full length of the product storage portion of the cabinet and at least a major portion of said duct has a substantially constant width; one end of said duct being in communication with the fan  
30 and the opposite end of said duct providing an end outlet; the portion of said duct between said ends being formed with a plurality of intermediate outlets adapted to supply air from said duct to the product storage portion of the cabinet; the size of said end outlet being substantially smaller than the size of said intermediate outlets, such that in use air in said duct is pressurized compared to the remainder of said cabinet.

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The end outlet may be formed in any suitable manner, e.g. by forming an aperture through the duct at or adjacent the end of the duct or by forming a flange which extends across part of the width of the duct and so forms an end outlet of reduced size.

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The fan assisted refrigeration unit may be mounted at any of a variety of positions on the cabinet, e.g. at the top of the cabinet or at the base of the cabinet or at one of the ends of the cabinet.

10 The degree of pressurization of the air in the duct compared to the remainder of the cabinet can be varied to suit the size and shape of the cabinet and the degree of refrigeration required. Typically, a pressure increase in the duct of about 60% compared to the remainder of the cabinet for a refrigerated cabinet which has a top mounted fan assisted refrigeration unit, is found to give good results in practice.

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#### Brief Description of Drawings

By way of example only, preferred embodiments of the present invention are described in detail, with reference to the accompanying drawings, in which:-

20 Fig. 1 shows a diagrammatic longitudinal section through a cabinet in accordance with a first embodiment of the invention;

Fig. 2 shows a diagrammatic longitudinal section through a cabinet in accordance with a second embodiment of the invention; and

25 Fig. 3 shows a diagrammatic longitudinal section through a cabinet in accordance with a third embodiment of the invention.

Referring to Fig. 1, a refrigerated cabinet 2 is of known type:- an insulated cabinet with a full height glazed door 3 and a top mounted refrigeration unit 4. The cabinet 2 is mounted on castors 5. The interior of the cabinet is provided with racks or shelves 6  
30 on which product 7 is displayed.

The refrigeration unit 4 is of conventional type, and fitted with an air circulation fan 8 powered by a fan motor in known manner. On leaving the fan 8, the cold air (arrows A) passes down a duct 10 formed down the back of the cabinet, and extending across  
35 the full width of the back of the cabinet.

To keep the product 7 chilled efficiently, it is important that the cold air is circulated evenly around the interior of the cabinet. However, in known designs of cabinet, the path of least resistance for the cold air is to pass directly down the duct 10 to the bottom of the cabinet; this is especially so when the cabinet contains a large volume of product and the space between adjacent shelves 6 is restricted. It will be appreciated that this leads to inefficient chilling of the product.

To overcome this problem, the width of the duct 10 is restricted by a flange 11 which extends across the full width of the back of the cabinet and leaves only a small space between the outer end of the flange 11 and the rear wall 13 of the cabinet as the end outlet 12. The effect of this restriction is to make it more difficult for air to enter the bottom space 14 below the lowest shelf in the cabinet and thus to pressurize the air in the duct. This pressurization of the duct 10 forces air out through intermediate outlets 15, 15a:- slots 15 formed across the duct 10 immediately below each of the cabinet shelves 6, (as indicated by Arrows B) and smaller slots 15a positioned between the slots 15; this gives a greatly improved distribution of air throughout the whole length of the cabinet.

The intermediate outlets 15, 15a may be of any length, but typically are formed as a series of short slots across the width of the duct, of larger size than the end outlet 12.

The second and third embodiment as shown in Figs 2 and 3 are of the same general type of design as that of Fig. 1 and similar parts are given the same reference numerals.

In the embodiment of Fig. 2, the refrigeration unit 4 is mounted at the bottom of the cabinet, so that cold air (Arrow A) passes upwards from the bottom of the cabinet along the duct 10. The end outlet 12a is formed as a small aperture in the wall of the duct 10. In this embodiment, the width of the duct 10 remains constant adjacent the end outlet 12a, (i.e. there is no equivalent to flange 11, Fig. 1). The fact that the end outlet 12a is small compared to the intermediate outlets 15, 15a has the effect of pressuring the air in the duct 10.

In the embodiment of Fig. 3, the refrigerated cabinet 2 is horizontal and the access door (not visible) is a hinged or sliding panel across the front of the cabinet. The

refrigeration unit 4 is mounted at one end of the cabinet and the duct 10 is formed along the top of the cabinet. As in the Fig. 2 embodiment, the end outlet 12b of the duct is formed as a small aperture in the wall of the duct.

- 5 In Fig.s 2 and 3, the cold air coming from the refrigeration unit is indicated by Arrow A and the air circulating through the food storage area by Arrows B.

Claims:

1. A refrigerated cabinet which includes a fan assisted refrigeration unit and a duct in communication with said fan, said duct being adapted to distribute cold air from said fan throughout said cabinet;  
5 wherein said duct extends substantially the full width and the full length of the product storage portion of the cabinet and at least a major portion of said duct has a substantially constant width; one end of said duct being in communication with the fan and the opposite end of said duct providing an end outlet; the portion of said duct between said ends being formed with a plurality  
10 of intermediate outlets adapted to supply air from said duct to the product storage portion of the cabinet; the size of said end outlet being substantially smaller than the size of said intermediate outlets, such that in use air in said duct is pressurized compared to the remainder of said cabinet.
- 15 2. The cabinet as claimed in claim 1, wherein said end outlet is formed by an aperture through the duct at or adjacent the end of the duct.
3. The cabinet as claimed in claim 1, wherein said end outlet is formed by a flange extending across part of the width of said duct.  
20
4. The cabinet as claimed in any one of the preceding claims, wherein said fan assisted refrigeration unit is mounted at the top of the cabinet.
5. The cabinet as claimed in any one of claims 1 – 3, wherein said fan assisted  
25 refrigeration unit is mounted at the base of the cabinet.
6. The cabinet as claimed in any one of claims 1 – 3, wherein a fan assisted refrigeration unit is mounted at one end of the cabinet.





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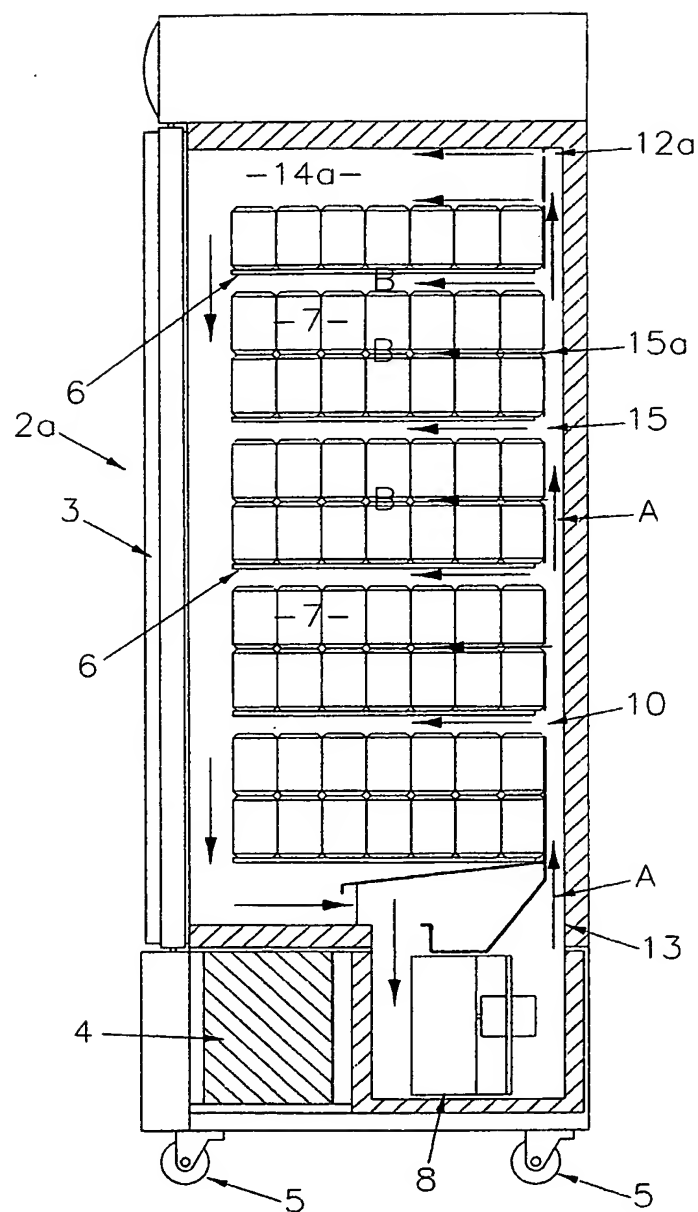


Fig.2

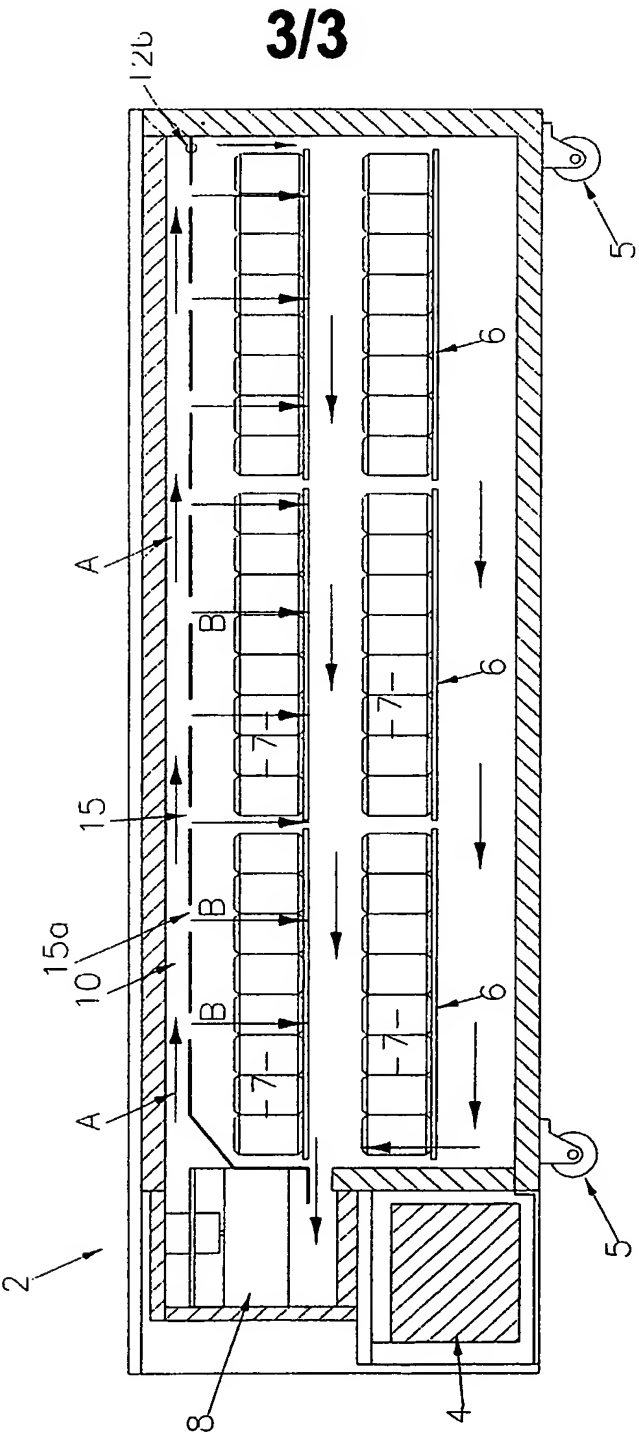


Fig. 3

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/NZ2004/000019

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int. Cl. <sup>7</sup> : F25D 017/08 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) F25D 017/08 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched NONE Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI: F25D 017/08 and (Keywords: pressur+ or width)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent Abstract Accession No 1999-401640/34, Class Q75, JP 11-159937 A (OKAMURA SEISAKUSHO KK) 15 June 1999 See diagram	1-3, 5, 6
X	Derwent Abstract Accession No 98-442316/38, Class Q75, JP 10-185406 A (SAMSUNG ELECTRONICS CO LTD) 14 July 1998 See diagram	1-3
P, X	Derwent Abstract Accession No 2003-642011/61, Class Q75, X27, JP 2003-240407 A (TOSHIBA KK) 27 August 2003 See diagram	1-6
P, X	Derwent Abstract Accession No 2003-642012/61, Class Q75, X27, JP 2003-240408 A (TOSHIBA KK) 27 August 2003 See diagram	1-6
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
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Date of the actual completion of the international search 24 March 2004		Date of mailing of the international search report - 7 APR 2004
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929		Authorized officer GREGORY DIVEN Telephone No : (02) 6283 2992

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ2004/000019

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages (Remove spaces when completed if the page is too long)	Relevant to claim No.
X	Derwent Abstract Accession No 94-023493/03, Class X27, JP 05-332665 A (SANDEN CORP) 14 December 1993 See diagram	1-4, 6
A	US 5209073 A (THOMAS, DAVID A et al) 11 May 1993 See whole document	
A	US 5377498 A (CUR, NIHAT O. et al) 3 January 1995 See whole document	
A	US 5765388 A (JEON YONG-DEOK) 16 June 1998 See whole document	

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/NZ2004/000019

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member		
JP	11159937	NONE			
JP	10185406	CN 1186211	KR 187197	US 5921104	
		US 6070419			
JP	2003240407	NONE			
JP	2003240408	NONE			
JP	05332665	NONE			
US	5209073	AT 208067	AU 86963/91	AU 16473/92	
		DE 69232169	EP 0576574	EP 1186970	
		JP 63250285	JP 63250287	JP 63250291	
		JP 63309080	US 4890165	US 5357765	
		US 5490276	WO 9216905		
US	5377498	BR 9303379	CA 2101415	DE 69305455	
		EP 0583909	ES 2092773	JP 6174315	
		MX 9304942	US 5231847	US 5375428	
US	5765388	CN 1177716	JP 10246553	KR 171523	
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